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**Optical Probing of Magnetic Fields in a Self-Injected Laser Wakefield Accelerator** M. KALUZA, S.P.D. MANGLES, A.G.R. THOMAS, C.D. MURPHY, Z. NAJMUDIN, A.E. DANGOR, K. KRUSHELNICK, The Blackett Laboratory, Imperial College London, SW7 2AZ, UK — The use of lasers as particle accelerators has recently attracted new attention due to the generation of quasi-monoenergetic electron beams from a self-injected laser wakefield accelerator. A recent experiment was carried out at the ASTRA facility at Rutherford Appleton Laboratory (UK), where a 35 fs 400 mJ laser pulse was focused into a gas jet. While a magnetic spectrometer measured the electron energy distributions showing monoenergetic spikes, the Faraday rotation of a transverse probe pulse was used to measure the magnetic field distribution around the plasma channel with high spatial and temporal resolution. Taking into acount the electron density distribution in the plasma, which was measured with a Nomarski interferometer, clear evidence of Mega-Gauss magnetic fields could be observed in the wake of the laser pulse. These magnetic fields are directly related to the electron current in the plasma. The results are compared with $2-D$ PIC simulations.

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